DOCUMENT RESUME

ED 445 116 TM 031 799

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TITLE Effects of Differential Prediction in College Admissions for Traditional- and Nontraditional-Aged Students. ACT Research Report Series.
INSTITUTION American Coll. Testing Program, Iowa City, IA.
REPORT NO ACT-RR-2000-9
PUB DATE 2000-07-00
NOTE 32p.
AVAILABLE FROM ACT Research Report Series, P.O. Box 168, Iowa City, IA 52243-0168.
PUB TYPE Reports - Research (143)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Age Differences; *College Admission; College Entrance Examinations; Higher Education; *Nontraditional Students; *Prediction; Regression (Statistics); *Scores; Test Use
IDENTIFIERS *ACT Assessment

ABSTRACT

This study determined whether using ACT Assessment Composite score, high school grade average, or both predictors jointly for college admissions would result in differential prediction or differential outcomes for traditional-aged and nontraditional-aged students. The analyses were based on data from 112,341 students at 79 postsecondary institutions. Both total-group and within-age group regression models were estimated by institution. Linear regression models were used to predict students' first-year college grade average. Corresponding logistic regression models predicted students' chances of a 2.5 or higher or 3.0 or higher grade point average (GPA). Validity statistics were calculated for each model by institution, and then summarized across institutions. The results for the total-group and within-group models and optimal cutoffs were then compared. The total-group ACT Composite and high school grade average models slightly overpredicted the first-year GPAs of nontraditional-aged students, and they underpredicted the GPAs of traditional-aged students. When used jointly as predictors, virtually no differential prediction or differential effects were found for the two age groups. (Contains 5 tables and 16 references.) (SLD)

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ACT Research Report Series 2000-9

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Julie Noble

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Julie Noble

Abstract

This study determined whether using ACT Composite score, high school grade average, or both predictors jointly for college admissions would result in differential prediction or differential outcomes for traditional-aged and nontraditional-aged students. The analyses were based on data from 112,341 students at 79 postsecondary institutions.

Both total-group and within-age group regression models were estimated by institution. Linear regression models were used to predict students' first-year college grade average. Corresponding logistic regression models predicted students' chances of a 2.5 or higher, or 3.0 or higher, GPA. Validity statistics were calculated for each model, by institution, and then summarized across institutions. The results for the total-group and within-group models and optimal cutoffs were then compared.

The total-group ACT Composite and high school grade average models slightly overpredicted the first-year GPAs of nontraditional-aged students, and they underpredicted the GPAs of traditional-aged students. When used jointly as predictors, virtually no differential prediction or differential effects were found for the two age groups.

Effects of Differential Prediction in College Admissions for Traditional- and Nontraditional-Aged Students

In recent years, the percentage of nontraditional students enrolled in college has increased. As defined by the National Center for Education Statistics (NCES; 1996), nontraditional students include those students with one or more of the following characteristics: did not enroll in postsecondary education for at least one year after high school, part-time enrollment, financially independent, worked full-time while in college, had dependents, was a single parent, or did not have a standard high school diploma. Between 1986 and 1992 the percentage of "moderately" nontraditional college students (delayed college enrollment, part-time, and financially independent) increased from one in four undergraduates to nearly one in three undergraduates (NCES, 1996).

An important characteristic of nontraditional students is their age. Among "moderately" and "highly" nontraditional undergraduates (students with four or more nontraditional characteristics), 89% to 99% were older than was the typical undergraduate, while 38% to 48% of "minimally" nontraditional students (one nontraditional characteristic) were older. All other characteristics aside, enrollment of older undergraduates alone increased from 54% of all undergraduates to 59% between 1986 and 1992.

In general, nontraditional students are concentrated in two-year colleges (e.g., 62% of undergraduates of age 30 or more enroll in two-year colleges, as compared to 38% of students of 23 or younger; NCES, 1995). However, the increase in nontraditional undergraduates has not been limited to two-year colleges: Between 1986 and 1992 four-year public institutions saw an increase in nontraditional students from 31% to 39%; four-year private institutions saw an increase from 15% to 22% (NCES, 1996).

With the increase in the number of nontraditional-aged students enrolling in college, one concern, particularly of four-year colleges, is the appropriate standards to use in admitting these students. Are the standards used for traditional-aged college students (i.e., high school grades, standardized test scores) appropriate for nontraditional students? Given the varying time delays between high school and college, high school grades might not accurately reflect students' current knowledge and skills. Two studies (Levitz, 1982; Breland, Maxey, McLure, Valiga, Boatwright, Ganley, & Jenkins, 1995) showed that institutions tend to make admission decisions for nontraditional-aged students differently from those for traditional-aged students. For example, Levitz found that private two-year, and public and private doctoral degree granting institutions were more likely than other types of institutions to require nontraditional-aged students to have standardized test scores for admission. However, selective institutions were more than two times as likely to require test scores for traditional-aged students than for nontraditional-aged students.

Research seems to support using differential admissions criteria for traditional and nontraditional-aged students. Studies have shown that test scores and high school grades, used jointly, underpredict the first-year college GPAs of nontraditional-aged college students, relative to traditional-aged students (Casserly, 1982; Levitz, 1982; Sawyer, 1985). However, these studies were limited in two important ways: First, all three studies used a joint prediction model based on standardized test scores and high school grades. The relative accuracy of these variables was not compared. Second, none of the studies considered or controlled for prior selection in admissions and the resulting restriction of range problems (Linn, 1983). Moreover, the Casserly data were limited to three institutions.

In traditional college admissions, the typical decision is whether a student should be admitted into a college. For this use of admissions criteria (e.g., test scores or high school grades),

statistics such as R^2 or χ^2, standard errors of estimate (SEE), or differences in linear regression slopes, are less informative. A more meaningful approach is to determine how differential prediction affects the outcomes of admission decisions for different age groups. Sawyer (1996) developed an approach to course placement validation, later applied to college admissions validation (ACT, 1997), that focuses on estimating the percentage of correct decisions made about an unselected group of students (i.e., the students for whom a decision is to be made). The estimates are based on logistic regression models developed for students who complete their first year of college.

This research investigated the differential effects of admission decisions on traditional and nontraditional-aged first-year college students. Using Sawyer's approach would show, in practical terms, the implications of admission decisions for these age groups. It would also correct for restriction of range problems identified by Linn (1984) by estimating the effects of admission decisions on an unselected group of students.

Although research has shown that using test scores in combination with high school grade average results in differential prediction, it has not compared the differential *effects* of using high school grade average in admissions with that of test scores. Therefore, test scores and high school grade averages were used separately as predictor variables, as well as jointly; the differential effect of admission decisions based on high school grade average or on test scores were then compared.

It should be noted that although ACT test scores and high school grades measure important academic skills needed for success in college, they do not measure all relevant variables. Admission systems need to supplement test scores and high school grades with other academic and nonacademic information, such as courses taken in high school, motivation, relevant work experience, interests in high school, and students' educational and career goals. Moreover, there

are other outcomes of a college education that are not strictly academic in nature (e.g., a student's ability to work with others, intellectual curiosity, etc.), but that may be important goals of an institution. If such outcomes are validly measured, then such information could also be used in making admission decisions.

Data

The data for this study were taken from the ACT Prediction Research (ACT, 1997) file for the 1996-97 freshman class. The file consisted of the background characteristics, high school grades, ACT scores, and college grades for 219,443 first-year students from 301 colleges. The particular variables used in this study were the ACT Composite score, the high school grade average (HSAV) based on self-reported high school grades, first-year college grade average (GPA), and birth date. All students had taken the ACT Assessment within two years of enrolling in college.

The ACT Assessment consists of four academic tests (in English, Mathematics, Reading, and Science Reasoning) and a Composite score, a Student Profile Section, an Interest Inventory, and the Course Grade Information Section (CGIS). The Composite score is the arithmetic average of the four academic test scores; test scores are reported on a scale of 1 to 36. The CGIS collects information about students' grades in 30 specific high school courses. Self-reported grades collected by the CGIS have been found accurate, relative to information provided on students' transcripts (Sawyer, Laing, & Houston, 1988).

Age was calculated as the difference between 1996 and birth date. Consistent with Sawyer (1985) and Levitz (1982), traditional-aged students were defined as those students between the ages of 17 and 19, and nontraditional-aged students were defined as those students 20 years old and older. To help ensure statistical stability and consistency of age groups across institutions, only data from institutions with at least 25 nontraditional-aged and 25 traditional-aged students were used.

The sample for each institution was also limited to students with ACT Composite scores, high school grade averages, and first-year college GPAs. The resulting sample consisted of 179,055 enrolled students from 143 institutions.

In addition, 541,972 nonenrolled students were identified from the 1996-97 ACT Class Profile (ACT, 1997) history, a database consisting of enrollment information and ACT Assessment records of enrolled and nonenrolled students from over 900 institutions. Nonenrolled students had requested that their ACT scores be sent to at least one of the 143 institutions, but they did not enroll in that institution. These students, plus those who actually enrolled in an institution and completed their first year, were identified as the applicant pool for that institution.

Method

Descriptive Statistics

For each age group and the total group, mean ACT Composite scores and mean HSAV values were computed by institution. Descriptive statistics for each institution were calculated for students who completed the first year of college, as well as for the entire applicant pool. Mean first-year GPAs were calculated by institution for students who completed the first year of college. Distributions of these statistics were then summarized across institutions for the total-group and by age group using minimum, median, and maximum values.

Linear Regression

Linear regression analyses were performed to determine whether, as prior research has shown, there was differential prediction of first-year GPA for traditional-aged and nontraditional-aged students. Separate regression models were developed using ACT Composite score, high school grade average (HSAV), or both variables jointly. Linear regression models were developed both for the total-group and within each age group.

Four statistics were calculated for each college, regression model, and age group:

1. R: the correlation between predicted and earned first-year GPA.
2. RMSE: the square root of the average squared difference between predicted and earned first-year GPA. Smaller values of RMSE correspond to more accurate predictions. (This statistic is also sometimes called the "standard error of estimate.")
3. Mean difference: the average observed difference between predicted and earned first-year GPA. Negative values correspond to overprediction and positive values correspond to underprediction.
4. MAE: the average of the absolute value of the difference between predicted and earned first-year GPA.

Distributions of these statistics were then summarized across institutions using minimum, median, and maximum values.

Logistic Regression

Two general logistic regression models were developed for each institution for predicting first-year success outcomes (GPA of 2.5 or higher; GPA of 3.0 or higher):

1. Total-group regression model, consisting of a single prediction equation for both age groups. The predictors were ACT Composite score, HSAV, or ACT Composite score and HSAV used jointly.

2. Within-age group model, consisting of separate prediction equations for each age group.

These models would illustrate the differential effects on age groups of using one set of cutoffs for all students or cutoff scores specific to each age group.

Differential Prediction

Probabilities of 2.5 or higher, or 3.0 or higher, GPA were calculated for each student using the appropriate within-group and total-group ACT Composite, HSAV, and joint predictor models. The logistic regression weights from the models were applied to the ACT Composite scores and HSAV values of all students at each institution with valid predictor data (i.e., the applicant pool), resulting in estimated probabilities of success for each student based on all six models. Differences

between within-group and total group probabilities were then calculated for each set of predictor variables. Finally, mean differences in probability between the total-group and within-group models were calculated for each institution, age group, and set of predictor variables; mean differences were then summarized across institutions using median, minimum, and maximum values.

Differences in probability (using the within-group ACT, HSAV, and joint models) between the two age groups were also calculated at each value of the predictor(s). Weighted mean between-age group differences in probability were then calculated for each set of predictor variables, where the difference at each value of the predictor(s) was weighted by the number of nontraditional-aged students in the applicant pool at that value. Mean differences were then summarized across institutions using median, minimum, and maximum values.

Differential Effects

For each age group within each institution, two sets of optimal cutoff scores were identified using ACT Composite score, HSAV, or ACT score and HSAV used jointly, as predictors--one based on the total-group regression model (referred to as the *total-group* cutoff score) and the other based on the within-age group model (referred to as the *within-group* cutoff score). Optimal cutoff scores correspond to a .50 probability of success for a given model, and maximize the estimated percentage of correct admission decisions. For the two-predictor model, combinations of ACT Composite and HSAV cutoffs corresponding to a probability of success of .50 were identified for both the total-group and within-group models.

Using the two sets of optimal cutoff scores for each institution, the following statistics were estimated for each age group: 1) the percentage of students who would not be admitted, 2) the percentage of successful students among those who would be admitted (success rate), (3) the

percentage of correct admission decisions (accuracy rate), and (4) the increase in the percentage of correct admission decisions over admitting all applicants (increase in accuracy rate). Correct admission decisions include admitted students who were successful and non-admitted students who would have not been successful, had they been admitted. All statistics were summarized across institutions using minimum, median, and maximum values.

Estimated success rates and accuracy rates were calculated through the conditional probabilities of success (first-year grade average of 2.5 or higher or 3.0 or higher) for individual students in the applicant pool, as estimated by the within-group regression models (Sawyer, 1996). Estimated within-group success rates and accuracy rates were calculated using both a suboptimal cutoff (i.e., the total-group cutoff) and optimal cutoffs (i.e., the within-group cutoffs). The resulting two sets of success rates and accuracy rates, as well as the corresponding probabilities, percent not admitted, and increase in accuracy rates, were then compared to assess differential effects.

The same procedure was followed for the two-predictor model: Optimal total-group cutoff score combinations were imposed on the within-group models. Within-group probabilities of success, estimated accuracy rates, estimated success rates, percent not admitted, and estimated increase in accuracy rate were calculated by institution, and then summarized across institutions using median, minimum, and maximum values.

As noted earlier, the optimal cutoff typically corresponds to a probability of success of .50. For some institutions and predictor variables, however, the probability of success closest to .50 might be sufficiently distant (± .05) from .50 to be misleading. This typically occurs when the fitted probabilities either all exceed .50 or are all less than .50. Moreover, some institutions might show negative predictor/criterion relationships, often due to insufficient variability in the predictor or criterion variable (e.g., a high percentage of students with first-year grade averages of 2.5 or higher)

or to criterion variables that measure factors other than educational achievement. All institutions where these situations occurred were eliminated from the linear and logistic analyses. A maximum of 14% of the ACT Composite models and 27% of the HSAV models met the first condition, and an additional six institutions had negative predictor/criterion relationships for one or more of the total-group or within-group models. These conditions resulted in a final sample of 112,341 students from 79 institutions. Of these institutions, 73% were four-year colleges.

Compared to the 143 institutions in the original sample, the 79 remaining institutions were less likely to be located in a small city (32.9% vs. 39.3%) and more likely to be from the North Central Accrediting Region (69.2% vs. 62.0%). The two samples did not differ by admission policy (selectivity) or type of institution (two-year or four-year).

Results

The distributions of descriptive statistics are summarized in Table 1. For both enrolled students and the applicant pool, median, minimum, and maximum numbers of students, mean ACT Composite score, mean HSAV values, and mean first-year GPA are reported for the total-group and by age group.

For both enrolled students and the entire applicant pool, the median mean age for traditional-aged students was 18.7 (minimum/maximum mean age for enrolled students = 18.1/19.0; minimum/maximum mean age for the applicant pool = 18.4/18.8). In contrast, nontraditional-aged, enrolled students were slightly younger than their counterparts in the applicant pool, with respective median mean ages of 23.0 and 23.5. Minimum and maximum mean values for this age group were 20.0 and 32.6 for enrolled students, and 20.5 and 30.0 for students in the applicant pool.

Table 1

Distributions, Across Institutions, of Means and Standard Deviations of ACT Composite Scores, High School Grade Averages, and First-year GPAs, by Applicant/Enrollment Status and Age Group (79 institutions)

Applicant/ enrollment status	Age group	N		ACT Composite score				HSAV				First-year GPA			
				Mean		SD		Mean		SD		Mean		SD	
		Med	Min/ max	Med	Min/ max	Med	Min/ max	Med	Min/ max	Med	Min/ max	Med	Min/ max	Med	Min/ max
Enrolled students	Total group	1161	135/ 5469	21.0	15.6/ 26.7	3.78	2.80/ 4.69	3.15	2.60/ 3.74	.57	.30/ .69	2.53	1.93/ 3.19	.92	.64/ 1.45
	17-19	1068	56/ 4307	21.2	16.0/ 26.7	3.76	2.78/ 4.85	3.18	2.63/ 3.74	.56	.30/ .66	2.56	1.94/ 3.19	.92	.64/ 1.42
	20 and older	70	25/ 982	18.8	14.5/ 25.2	3.59	2.44/ 4.64	2.83	2.32/ 3.59	.59	.42/ .79	2.24	1.52/ 3.05	.98	.69/ 1.52
Applicant pool	Total group	3834	135/ 24240	20.3	15.4/ 24.3	3.93	2.66/ 4.59	3.07	2.63/ 3.52	.59	.46/ .69				
	17-19	3306	103/ 23475	20.5	15.8/ 24.4	3.91	2.69/ 4.55	3.11	2.67/ 3.53	.58	.45/ .66				
	20 and older	361	31/ 1378	18.2	14.2/ 21.8	3.76	2.17/ 5.03	2.81	2.40/ 3.22	.61	.52/ .76				

In general, enrolled students tended to have higher and more variable ACT Composite scores than did the entire applicant pool (median mean = 21.0 vs. 20.3; median standard deviation = 3.78 vs. 3.93). However, the median mean HSAV values and the median standard deviations were similar for the two groups.

For both the enrolled group and the applicant pool, nontraditional-aged students typically had lower mean ACT Composite scores and HSAV values than did traditional-aged students. Nontraditional-aged students also typically had lower mean first-year GPAs than did traditional-aged students (median GPA = 2.24 vs. 2.56, respectively). Moreover, nontraditional-aged students tended to vary less in both their ACT Composite scores and HSAV values than did traditional-aged students, as shown by the median standard deviations for both groups.

The median mean ACT Composite scores for both the enrolled group and the applicant pool were lower than the ACT Composite mean for first-year college students nationally (mean = 21.7; ACT, 1998). The median mean HSAV values were comparable, however, to the self-reported HSAV values for ACT-tested college freshmen (mean = 3.23).

Median ACT Composite, HSAV, and first-year grade averages were all higher than the means reported by Levitz (1982); no descriptive statistics were reported by Sawyer (1985). Moreover, the differences in median mean ACT Composite scores and HSAV values by age group shown here were smaller than the differences in means found by Levitz.

Linear Regression

The linear regression results were based on only those students who completed their first year in college and who had valid predictor data. Therefore, the results might be affected by range restriction.

Table 2 contains the results of the linear regression analyses. Minimum, median, and maximum R, RMSE, mean observed minus predicted differences, and MAE are provided for both within-group and

Table 2

Distributions, Across Institutions, of Linear Regression Statistics Using Within-Group and Total-Group Models (79 institutions)

Statistic	Age group	ACT Composite score				HSAV				ACT Composite and HSAV			
		Within-group model		Total-group model		Within-group model		Total-group model		Within-group model		Total-group model	
		Med	Min/ max	Med	Min/ max	Med	Min/ max	Med	Min/ max	Med	Min/ max	Med	Min/ max
R	17-19	.36	.18/ .61	.36	.18/ .61	.45	.28/ .73	.45	.29/ .73	.49	.31/ .73	.49	.31/ .73
	20 and older	.27	.02/ .66	.27	-.02/ .66	.34	.07/ .73	.34	.07/ .73	.41	.14/ .77	.39	.11/ .77
RMSE	17-19	.84	.58/ 1.36	.84	.58/ 1.36	.79	.58/ 1.32	.79	.58/ 1.32	.78	.54/ 1.30	.78	.54/ 1.30
	20 and older	.89	.64/ 1.47	.91	.64/ 1.45	.91	.58/ 1.50	.92	.58/ 1.50	.87	.58/ 1.46	.88	.59/ 1.45
Mean difference (observed-predicted)	17-19	.00	.00/ .00	.00	-.08/ .07	.00	.00/ .00	.00	-.15/ .06	.00	.00/ .00	-.00	-.13/ .04
	20 and older	.00	.00/ .00	-.08	-.41/ .25	.00	.00/ .00	-.04	-.33/ .52	.00	.00/ .00	.01	-.27/ .44
MAE	17-19	.65	.44/ 1.18	.64	.44/ 1.18	.62	.45/ 1.12	.62	.45/ 1.13	.60	.41/ 1.10	.60	.41/ 1.11
	20 and older	.70	.48/ 1.29	.71	.49/ 1.29	.70	.45/ 1.35	.70	.46/ 1.33	.67	.43/ 1.27	.68	.44/ 1.29

total-group models based on ACT Composite score, HSAV, and both predictors jointly. Overall, R, RMSE, and MAE values showed that prediction accuracy was lower for nontraditional-aged students than for traditional-aged students when using ACT Composite score, HSAV, or both predictors jointly. This was true for both the within-group and total-group models.

There were only minor differences in median R, RMSE, and MAE values between the within- and total-group models. Between-model differences were found when examining observed minus predicted values, however. The median mean differences showed that the total-group ACT and HSAV models overpredicted first-year grade averages of nontraditional-aged students (median = -.08 and -.04, respectively), compared to the within group model (medians = .00). However, when used jointly, the median mean differences for both models were near zero (total-group median = .01; within-group median = -.00).

Logistic Regression

Differential Prediction

Table 3 summarizes the distributions, across institutions, of mean differences between within-group and total-group probabilities of success for the three sets of predictor variables. For both traditional-aged and nontraditional-aged students, median mean differences in probabilities between the two models were at or near zero. However, mean differences in probability of success tended to be more variable across institutions for nontraditional-aged students, as shown by the minimum and maximum mean differences for each set of predictor variables. This might be a result of the smaller sample sizes for the nontraditional-aged student group.

Table 3

Distributions, Across Institutions, of Mean Differences in Within-Group and Total-Group Probabilities of Success (Within-group probability – Total-group probability)

Age group	Predictor variable	2.5 or higher GPA		3.0 or higher GPA	
		Median	Min/max	Median	Min/max
Nontraditional-aged	ACT Composite	-.02	-.23/.11	.00	-.14/.15
	HSAV	-.01	-.15/.15	.01	-.12/.21
	ACT Composite & HSAV	.01	-.14/.16	.02	-.07/.23
Traditional-aged	ACT Composite	.00	-.04/.06	-.00	-.06/.04
	HSAV	.00	-.05/.03	-.00	-.06/.03
	ACT Composite & HSAV	-.00	-.05/.04	-.00	-.06/.02

Table 4 summarizes the weighted mean differences between nontraditional and traditional-aged students' probabilities of success, using the three different sets of predictor variables. Differences at each value of the predictor(s) were weighted by the number of nontraditional-aged students in the applicant pool at that value. For both the 2.5 or higher and 3.0 or higher success criteria, mean differences in probabilities of success between age groups were typically very small (ranging from -.03 to +.03). However, mean differences in probability were again variable across institutions.

Table 4

Distributions, Across Institutions, of Weighted Mean Differences in Within-Group Probabilities of Success (Nontraditional-aged probability – Traditional-aged probability)

Predictor variable	2.5 or higher GPA		3.0 or higher GPA	
	Median	Min/max	Median	Min/max
ACT Composite	-.03	-.32/.15	.01	-.18/.18
HSAV	-.01	-.20/.22	.01	-.16/.26
ACT Composite & HSAV	.02	-.21/.23	.03	-.10/.26

Differential Effects

The results of using within-group and total-group optimal cutoff scores for both success criteria are shown in Table 5. Median, minimum, and maximum optimal cutoff scores, accuracy rates, increases in accuracy rates, success rates, and percent not admitted are reported for the ACT Composite, HSAV, and joint models. Note, however, that total-group and within-group cutoff values for the joint model are not reported in the table, due to the range of possible ACT Composite score and HSAV values that could be used. The corresponding median probabilities of success corresponding to these optimal cutoff score combinations are reported (typically .50) in the table. The most frequently occurring optimal cutoff score combinations are provided below.

2.5 or higher GPA. As shown in Table 5, the total-group and within-group results for the 2.5 or higher success criterion were very similar. The ACT Composite total and within-group median optimal cutoff scores were identical, with some variation across individual institutions (as shown by the minimum and maximum optimal cutoff scores). Thus, using the total-group and within-group optimal ACT Composite cutoff scores for both age groups resulted in similar accuracy rates (ARs), success rates (SRs), increases in accuracy rates (ΔARs), and percent not admitted for the two models.

The HSAV within-group median optimal cutoff for nontraditional-aged students was only slightly higher than the corresponding total-group median cutoff (2.94 vs. 2.86); within- and total-group median optimal cutoffs were similar for traditional-aged students. Consequently, median estimated ARs, SRs, and ΔARs based on total-group and within-group optimal cutoffs were similar. Median percent not admitted, however, differed slightly for the two models for nontraditional-aged students, with the total group model typically not admitting 54% and the within group model typically not admitting 59% of nontraditional-aged students.

Table 5

Distributions, Across Institutions, of Logistic Regression Statistics Using Within-Group and Total-Group Optimal Cutoffs* (Success criterion = 2.5 or higher, or 3.0 or higher, GPA)

Outcome	Type of cutoff	Predictor variable	Age group	Optimal cutoff		Est. accuracy rate		Est. increase in accuracy rate		Est. success rate		% Not admitted	
				Med	Min/ max	Med	Min/ Max	Med	Min/ Max	Med	Min/ Max	Med	Min/ Max
GPA of 2.5 or higher	Within-group [1]	ACT Composite	17-19	19	8/26	.66	.59/.81	.07	.00/.59	.66	.54/.81	31	0/89
			20 and older	19	1/30	.64	.44/.86	.16	.00/.70	.60	.44/.79	58	0/99
		HSAV	17-19	2.86	1.86/3.58	.70	.63/.83	.12	.00/.60	.71	.61/.84	34	2/87
			20 and older	2.94	0/3.99	.67	.55/.87	.17	.00/.63	.62	.50/.82	59	0/97
		ACT Composite & HSAV	17-19	.50	.50/.50	.71	.63/.84	.13	.00/.62	.73	.63/.84	37	2/86
			20 and older	.50	.50/.50	.68	.55/.87	.20	.00/.66	.66	.54/.82	61	1/88
	Total [2]	ACT Composite	17-19	19	8/26	.66	.59/.81	.07	.00/.59	.66	.54/.81	32	0/89
			20 and older	19	8/26	.62	.49/.86	.14	-.04/.69	.59	.36/.81	55	0/95
		HSAV	17-19	2.86	1.81/3.58	.70	.63/.83	.12	-.00/.60	.71	.61/.82	34	2/87
			20 and older	2.86	1.81/3.58	.65	.52/.85	.17	-.05/.63	.61	.42/.82	54	4/94
		ACT Composite & HSAV	17-19	.49	.13/.56	.71	.63/.84	.13	.00/.62	.72	.63/.82	38	2/86
			20 and older	.44	.08/.77	.67	.53/.85	.20	-.07/.64	.68	.49/.88	63	4/95
GPA of 3.0 or higher	Within-group [1]	ACT Composite	17-19	23	15/27	.72	.60/.84	.36	.01/.68	.62	.53/.73	75	11/99
			20 and older	25	1/36	.75	.25/.93	.49	.00/.85	.58	.25/.76	92	0/100
		HSAV	17-19	3.48	2.44/3.93	.73	.62/.84	.38	.03/.68	.63	.52/.78	70	19/96
			20 and older	3.59	2.43/4.00	.76	.56/.88	.51	.04/.74	.58	.45/.76	89	24/99
		ACT Composite & HSAV	17-19	.50	.50/.50	.75	.63/.85	.41	.03/.69	.67	.56/.77	72	21/96
			20 and older	.50	.50/.50	.78	.56/.90	.52	.04/.78	.63	.50/.84	86	23/98
	Total [2]	ACT Composite	17-19	23	16/27	.71	.60/.84	.36	.01/.68	.62	.53/.69	75	14/99
			20 and older	23	16/27	.74	.54/.92	.48	-.03/.84	.54	.16/.95	91	26/100
		HSAV	17-19	3.48	2.44/3.92	.73	.62/.84	.38	.03/.68	.64	.52/.75	71	19/96
			20 and older	3.48	2.44/3.92	.75	.55/.87	.50	.03/.73	.57	.38/.90	85	32/99
		ACT Composite & HSAV	17-19	.49	.25/.53	.75	.63/.84	.41	.03/.68	.67	.56/.74	72	22/96
			20 and older	.44	.08/1.00	.77	.55/.90	.50	.02/.77	.63	.29/1.00	88	40/99

* Note: All statistics are based on the within-group models.

[1] Optimal cutoffs pertain to the probabilities of success from the within-group models corresponding to within-group optimal cutoff scores.

[2] Optimal cutoffs pertain to the probabilities of success from the within-group models corresponding to total-group optimal cutoff scores.

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The joint ACT Composite and HSAV total-group cutoffs resulted in median statistics similar to those for the within-group cutoffs, except for the median probability of success for nontraditional students. Using the total group optimal cutoff combinations resulted in a somewhat lower median probability than did the within-group optimal cutoff combinations (.44 vs. .50). However, this difference did not substantively impact the other median statistics. Moreover, the joint models slightly increased median AR, SR, ΔAR, and percent not admitted for both age groups, compared to the separate ACT Composite and HSAV models.

Joint model total-group and within-group optimal ACT Composite and HSAV cutoffs were, in general, similar. The most frequently occurring within-group, joint-model optimal cutoffs, across institutions, were HSAV values between 2.6 and 3.6 and ACT Composite scores between 14 and 24 (nontraditional-aged) and 13 and 25 (traditional-aged). The corresponding total-group, joint-model optimal cutoffs ranged from 2.0 to 3.4 for HSAV and 15 to 26 for the ACT Composite. Higher HSAV values were paired with lower ACT Composite scores, and vice versa.

Comparing the results for traditional- and nontraditional-aged students based on ACT Composite, HSAV, and the two variables used jointly, prediction accuracy, as measured by median estimated AR, was generally slightly lower for nontraditional-aged students than for traditional-aged students. Moreover, median estimated SRs were lower, and median percent not admitted were higher, for nontraditional-aged students. In contrast, median estimated ΔARs were generally higher for nontraditional-aged students than for traditional-aged students (by .05-.09).

3.0 or higher GPA. The total-group and within-group results based on ACT Composite score were similar for the 3.0 or higher GPA success criterion. The ACT Composite within-group median optimal cutoff score for nontraditional students was slightly higher than their corresponding total-group optimal cutoff score (25 vs. 23). However, the corresponding median ARs, SRs, ΔARs, and percent not admitted

were similar.

The HSAV within-group median optimal cutoffs were similar to the corresponding total-group median cutoffs for traditional-aged students; for nontraditional-aged students, within-group median optimal cutoffs were slightly higher (3.59 vs. 3.48). However, median estimated ARs, SRs, ΔARs, and percent not admitted based on total-group and within-group optimal cutoffs were similar for both age groups. The joint ACT Composite and HSAV total-group cutoffs resulted in median statistics similar to those for the within-group cutoffs. The one exception, again, was the median probability of success for nontraditional-aged students. Using total group optimal cutoff combinations resulted in a somewhat lower median probability than did the within-group optimal cutoff combinations (.44 vs. .50, respectively). However, this difference did not substantively impact the other median statistics. Moreover, the joint models slightly increased median AR, SR, ΔAR, and percent not admitted for both age groups, compared to the separate ACT Composite and HSAV models.

Joint model total-group and within-group optimal HSAV cutoffs were, in general, similar for the 3.0 or higher GPA success criterion. The most frequently occurring within-group optimal HSAV cutoffs, across institutions, were values of 2.6 to 4.0 (nontraditional-aged) and 3.0 to 4.0 (traditional-aged), with comparable total-group cutoffs ranging from 2.6 to 4.0. Optimal ACT Composite cutoffs differed between the within-group and total-group models: The most frequently occurring optimal ACT Composite cutoff scores based on the within-group model were 19 to 28 and 17 to 28 for nontraditional-aged and traditional-aged students, respectively. For the total group model, optimal cutoff scores ranged from 14 to 33. As was noted earlier, higher HSAV values were paired with lower ACT Composite scores, and vice versa.

Comparing the results for traditional- and nontraditional-aged students based on ACT Composite, HSAV, and the two variables used jointly, prediction accuracy, as measured by median estimated AR, was

generally slightly higher for nontraditional-aged students than for traditional-aged students. As was noted earlier for the 2.5 or higher GPA criterion, median estimated ΔARs and percent not admitted were generally higher for nontraditional-aged students than for traditional-aged students (by .11-.13 and 14%-19%, respectively). However, median estimated SRs were lower for nontraditional-aged students than for traditional-aged students.

Conclusions

This study showed that using total group joint ACT Composite and HSAV models did not over- or underpredict the first-year GPAs of traditional- and nontraditional-aged students. This result was true regardless of the prediction method used. Moreover, using total group versus within-group optimal cutoff scores/values appeared to have little effect on the results for both age groups, based on a 2.5 or higher GPA success criterion.

In contrast, somewhat conflicting results were found when using ACT Composite scores or HSAV values as single predictors: A slight overprediction of first-year GPA was found for nontraditional-aged students using either predictor in a linear regression model. This result was observed to a much lesser degree using logistic regression methods. However, for the 3.0 or higher success criterion, within-group ACT Composite and HSAV optimal cutoffs used alone were typically slightly higher for nontraditional-aged students than were the corresponding total-group optimal cutoffs, but this difference had little effect on the other statistics.

Decisions based on ACT Composite scores, HSAV values, and both variables used jointly were generally more accurate for traditional-aged students than for nontraditional-aged students. However, for the success criterion of a 3.0 or higher GPA, decisions based on these variables were slightly more accurate for nontraditional-aged students. In addition, the median ΔARs showed that increases in accuracy resulting from using these variables for admissions were greater for nontraditional-aged students than for traditional-

aged students for both success criteria.

Nontraditional-aged students also had lower average ACT Composite scores, high school averages, and first-year GPAs than did traditional-aged students. This result, and the lower accuracy rates for nontraditional-aged students, was consistent with their lower estimated success rates and percent not admitted.

The findings of this study differed from those of Sawyer (1985) and Levitz (1982), where the total group model underpredicted first-year GPAs of nontraditional students. It should be noted that both of these studies used four test scores and four high school grades as predictor variables, whereas this study used two predictors (ACT Composite score and HSAV). Sawyer also used two-variable (ACT Composite and HSAV) dummy-variable and within-group models. Underprediction for these reduced models was near zero, with crossvalidated median observed minus predicted mean differences of .03 and .04 for nontraditional-aged students.

A second important difference is that both studies were based on traditional- and nontraditional-aged students enrolled in college in the early 1970's. As noted in the introduction, though nontraditional-aged students are more likely to enroll in two-year institutions, their enrollment in four-year institutions has increased over time (NCES, 1996). The majority of the institutions used for this study were four-year institutions. Moreover, one would expect that the demographic characteristics of nontraditional-aged students have changed since the early 1970's. Levitz (1982) showed differences between 1972 and 1977 in the gender and ethnicity of ACT-tested first-year nontraditional-aged freshmen. For example, in 1972, 25% of the freshmen aged 20-25 were ethnic minorities and 64% were male, compared to 31% ethnic minority and 53% male in 1977. In comparison, typically 13% of nontraditional-aged students in this study were ethnic minorities and 61% were male. Levitz also found that nontraditional-aged students were more likely to have low family incomes than were traditional-aged students, and more likely to aspire to two-year

degrees than traditional-aged students. In this study, 30% of ACT-tested nontraditional-aged students, in general, had family incomes of $24,000 or less, compared to 16% of traditional-aged students, but were as likely as traditional-aged students to aspire to Bachelor's or advanced degrees. Typically 88% of nontraditional-aged students in this study planned to complete at least a Bachelor's degree, compared to about 70% in 1972 and about 65% in 1977 (Levitz, 1982).

Another important difference between this study and the Levitz (1982) and Sawyer (1985) studies is that the earlier studies were cross-validation studies. The models used in this study were not cross-validated.

The results for the 2.5 or higher success criterion differed somewhat from those for the 3.0 or higher success criterion. Total-group optimal ACT Composite and HSAV cutoffs differed from those for the within-group optimal cutoffs for nontraditional-aged students for the 3.0 or higher success criterion. In addition, accuracy rates for the 3.0 or higher success criterion were typically higher than were those for the 2.5 success criterion. These differences could be attributable to college grading practices. As noted in a 1994 newspaper article (Pothoven, 1994), a grade of C is no longer "average." For several universities, relatively higher percentages of undergraduate college grades (e.g., 70% to 78%) were A's and B's (Shea, 1994; Pothoven, 1994). GPAs of 3.0 or higher might better reflect actual academic achievement than GPAs of less than 3.0.

Implications

The results of this study support the joint use of ACT Composite and high school grade average for admitting nontraditional-aged students to college. Typically, these students would not be either disadvantaged or advantaged by applying the same admissions standards as those used for traditional-aged students. In comparison, using either ACT Composite score or high school grade average alone would likely result in slightly lower accuracy rates. Moreover, using the two variables, rather than one,

would allow students with lower high school averages to increase their chances of admission by having higher ACT Composite scores, and vice versa. Finally, by also considering other academic and noncognitive factors in admissions, differences between the two age groups would likely be reduced even further.

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